ES-96/036

June 26, 1996

Mr. Robert W. Hargrove, Chief
Environmental Impacts Branch
U.S. Environmental Protection Agency, Region II
290 Broadway
New York, New York 10007-1866

Dear Mr. Hargrove:

In response to the U.S. Environmental Protection Agency's (EPA) August 9, 1995 request for initiation of formal consultation, received August 14, 1995, the U.S. Fish and Wildlife Service (Service) has reviewed the EPA, Region II's proposed action of approving the State of New Jersey's Surface Water Quality Standards, April 1994 Revision (NJSWQS), prepared by the State pursuant to Section 303 of the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq*.). Enclosed is the Service's biological opinion on the effects of EPA's proposed approval of the NJSWQS on the federally listed threatened bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus anatum*), and endangered dwarf wedgemussel (*Alasmidonta heterodon*) in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (ESA).

A complete administrative record of this consultation is on file in the Service's Ecological Services, New Jersey Field Office. If you have any questions regarding this biological opinion, please contact Annette Scherer or Dr. Robert Frakes of my staff.

Sincerely,

Clifford G. Day
Supervisor

Enclosure

cc: NJFO
ARD, R5, Northern Area
ARD, R5, Central Area
R5: Ralph Abele
R5, Endangered Species: Mignogno
WO, DEC: Kubiak
R5, Solicitor's Office: Lepore
PAFO: Copeyon
NJDEP, ENSP: Niles

Biological Opinion on the Effects of the U.S. Environmental Protection Agency's Approval of the State of New Jersey's Surface Water Quality Standards on the Bald Eagle, Peregrine Falcon, and Dwarf Wedgemussel

Prepared for:

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Prepared by:

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June 1996

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I. INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has reviewed the U.S. Environmental Protection Agency's (EPA), Region II's proposed action of approving the State of New Jersey's Surface Water Quality Standards, April 1994 Revision (NJSWQS), prepared by the State pursuant to Section 303 of the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq*.). Pursuant to formal consultation, the information that is presented hereafter is the Service's biological opinion on the effects of EPA's proposed approval of the NJSWQS on the federally listed threatened bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus anatum*), and endangered dwarf wedgemussel (*Alasmidonta heterodon*) in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (ESA). At issue are provisions in the NJSWQS mixing zone policy, antidegradation policy, and the proposed aquatic life and human-health criteria for compounds with a high potential for bioaccumulation and food chain transfer to higher trophic levels (i.e., polychlorinated biphenyls (PCBs), mercury, and dichlorodiphenyltrichloroethane (DDT) and its derivatives).

The EPA, Region II did not provide the Service with New Jersey-specific biological data or assessments of biological impacts regarding the proposed NJSWQS. Therefore, formulation of this biological opinion was based on currently available scientific and commercial information, including other biological opinions completed by the Service regarding water quality issues in other parts of the Nation (referenced within the opinion). A complete administrative record of this consultation is on file in the Service's Ecological Services, New Jersey Field Office.

II. CONSULTATION HISTORY

- By letter dated October 19, 1994, the EPA, Region II requested informal consultation with the Service regarding EPA's proposed approval of the NJSWQS. The EPA requested the Service's concurrence with the EPA's determination that the proposed NJSWQS were not likely to adversely affect federally listed threatened and endangered species.

- On December 2, 1994, the Service issued a letter notifying EPA, Region II that the Service had identified concerns regarding potential adverse effects to federally listed species from the proposed NJSWQS criteria and would be reviewing the criteria in further detail.

- In a January 5, 1995 letter to EPA, Region II, the Service provided a list of endangered, threatened, and candidate species occurring within the action area (State of New Jersey) that may be affected by EPA's proposed approval of the revised NJSWQS. The Service also identified areas of concern regarding potential adverse effects to federally listed species from the proposed NJSWQS. Specifically, provisions in the NJSWQS mixing zone policy and antidegradation policy are not sufficiently protective to avoid adverse impacts to federally listed species. In addition, the proposed aquatic life and human-health criteria for compounds with a high potential for bioaccumulation and food chain transfer to higher trophic levels (i.e., PCBs, mercury, and DDT and its derivatives) do not reflect the levels necessary to avoid adverse effects to the federally listed bald eagle and peregrine falcon.

- In a March 9, 1995 letter to the Service, EPA, Region II suggested that a meeting be arranged to discuss issues related to the NJSWQS and submitted a draft agenda.

- On March 10, 1995, the Service notified EPA by telephone that due to the complexity of issues related to the NJSWQS, the Service would prefer to have EPA, Region II's written response to concerns raised in the Service's January 5, 1995 letter. A response from EPA, prior to an interagency meeting, would assist the Service in focusing on unresolved issues and developing potential solutions.

- On March 22, 1995, the EPA, Region II notified the Service by telephone that the EPA was considering initiation of formal consultation and preferred not to respond in writing to the Service's January 5, 1995 letter.

- By letter to the EPA, Region II, dated April 11, 1995, the Service suggested a teleconference between the Service and the EPA in lieu of a meeting. Additionally, the letter reiterated the Service's concerns regarding the proposed NJSWQS.

- Through a series of telephone conversations between the Service and EPA occurring on May 9, 12, and 16, 1995 to coordinate schedules, a teleconference was scheduled for May 26, 1995.

- On May 23, 1995, the EPA, Region II notified the Service by telephone that the May 26, 1995 teleconference was cancelled and that EPA would contact the Service at a later date to reschedule the call.

- On August 14, 1995, the Service received EPA, Region II's August 9, 1995 letter reiterating EPA's request for the Service's concurrence with EPA's determination that the proposed NJSWQS were not likely to adversely affect federally listed species. The EPA further requested that, should the Service be unable to concur, formal consultation be initiated regarding the proposed NJSWQS.

- On September 11, 1995, the EPA, Region II informed the Service by telephone that the EPA wished to avoid formal consultation regarding the proposed NJSWQS. The EPA, Region II indicated that pursuant to internal commitments to the EPA Headquarters in Washington, D.C., the EPA, Region II was required to issue a decision regarding either approval or disapproval of the NJSWQS by September 29, 1995. Therefore, the EPA intended to disapprove the NJSWQS should the Service be unable to concur with EPA's determination of "no adverse affect."

- On September 15, 1995, the Service contacted the EPA, Region, II by telephone to determine whether EPA's September 29, 1995 deadline for a decision regarding approval or disapproval of the NJSWQS could be extended. The EPA, Region II was currently unable to extend the internal deadline established with EPA Headquarters in Washington, D.C., but stated an intention to investigate the possibility of such an extension.

- By letter dated September 25, 1995, the Service informed EPA, Region II that given the EPA's deadline of September 29, 1995 to make a decision on the approval or disapproval of the revised NJSWQS, the EPA had not allowed sufficient time for the formal consultation process to be completed. Therefore, if EPA could not delay or condition its final approval or disapproval of the revised NJSWQS until such time as formal consultation could be completed, the Service recommended that the NJSWQS be approved with modifications. The modifications were designed to minimize the likelihood that EPA, the State of New Jersey, and any applicant would "take" a listed species, and in so doing, violate Section 9 of the ESA. However, the Service reiterated that in approving the revised NJSWQS, the EPA would not be in compliance with Section 7 of the ESA.

- By letter dated September 29, 1995, the EPA, Region II notified the Service of its intention to delay EPA's decision on the approval or disapproval of the revised NJSWQS until formal consultation was concluded.

- In an October 3, 1995 letter to EPA, Region II, the Service informed the EPA that sufficient information to complete a formal consultation initiation package, as outlined in the regulations governing interagency consultations (50 CFR Section 402.14), had not been provided by the EPA. The Service provided the EPA with a list of items required to complete the initiation package. In addition, EPA was provided with maps depicting the New Jersey drainages with known occurrences of listed species to further define the Service's specific areas of concern.

- On November 6, 1995, the Service received the EPA's November 3, 1995 statement that the information necessary to complete the formal consultation initiation package was not available.

- By letter to EPA, dated December 6, 1995, the Service acknowledged receipt of EPA's November 3, 1995 statement that information required by 50 CFR Section 402.14 was not available. Although the EPA had not provided the Service with any relevant data, information, or assessment of biological impacts to federally listed species, to assist the EPA in proceeding with its decision regarding approval or disapproval of the revised NJSWQS, the Service accepted the November 6, 1995 receipt of EPA's statement regarding the unavailability of the required information as the initiation date for formal consultation. The Service's letter provided EPA with the date on which the formal consultation period would end and the date on which the Service would provide its biological opinion. Additionally, the Service notified the EPA that the mandatory federal furlough period of November 14 through 19, 1995, affecting components of the Service and EPA involved with this matter, would be excluded from the 90-day consultation period.

- During December 1995 and January 1996, attempts at scheduling a meeting between the Service and EPA were circumvented by the mandatory shutdown of federal agencies, including components of the Service and EPA, and the resulting disruption of work schedules. The furlough of December 16, 1995 through January 7, 1996, and the snow emergency of January 8 through 9, 1996, were excluded from the 90-day consultation period.

- In a January 19, 1996 letter to the Service, the EPA, Region II disputed the Service's recognition of November 6, 1995 as the initiation date of formal consultation.

- By letter dated January 31, 1996, the Service provided the EPA, Region II with a detailed explanation of how the Service arrived at the initiation date for formal consultation and again provided EPA with the date on which the formal consultation period would end and the date on which the Service would provide its biological opinion.

- On February 21, 1996, the Service and the EPA, Region II discussed (by telephone) the need for meeting during the formal consultation period. The Service stated a willingness to meet should the EPA, Region II have any information relevant to potential impacts to federally listed species from the revised NJSWQS for the Service to consider. However, the Service indicated that it was unwilling to meet for the sole purpose of debating the time frames established for the formal consultation period.

- By letter dated April 19, 1996, the Service notified the EPA, Region II that due to the complexity of the issues regarding the NJSWQS, the Service would require additional time to complete its biological opinion. Additionally, the Service notified EPA, Region II, that additional data and information (requested by the Service's October 13, 1995 letter to the EPA, Region II as necessary to complete EPA, Region II's formal consultation initiation package) was in fact available and eventually acquired by the Service during the consultation period. Therefore, the Service required additional time to assimilate this information into the biological opinion.

- No meetings between the Service and EPA, Region II to exchange information were held during the course of this consultation.

III. BIOLOGICAL OPINION

It is the Service's biological opinion that approval by the EPA of the 1994 revisions to the NJSWQS is not likely to jeopardize the continued existence of the bald eagle, American peregrine falcon, or dwarf wedgemussel. Critical habitat has not been designated or proposed for these species; therefore, no critical habitat will be destroyed or adversely modified.

IV. DESCRIPTION OF PROPOSED ACTION

The EPA proposes to approve the 1994 revisions to the Surface Water Quality Standards (N.J.A.C. 7:9B), prepared by the State of New Jersey pursuant to Section 303 of the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq*.), with the exception of the State's human-health based PCB criteria. The EPA intends to disapprove the proposed PCB criteria; therefore, the Federal Toxics Rule human-health criterion will remain in effect for PCBs in New Jersey. The provisions in the NJSWQS mixing zone policy (N.J.A.C. 7:9B-1.5 (c)4), antidegradation policy (N.J.A.C. 7:9B-1.5(d)), and the proposed aquatic life and human-health criteria (N.J.A.C. 7:9B-1.14(c)) for compounds with a high potential for bioaccumulation and food chain transfer to higher trophic levels are described below. Drainage basins in New Jersey supporting documented occurrences of the bald eagle, peregrine falcon, and dwarf wedgemussel are provided in Appendix A. Prior to this formal consultation, consultation pursuant to Section 7 of the ESA has never been conducted regarding EPA's approval or disapproval of these or any previously proposed revisions to the NJSWQS. Further, consultation pursuant to the ESA was not conducted with the Service for EPA's delegation of the National Pollution Discharge Elimination System permitting program to the State of New Jersey and approval of the New Jersey Pollutant Discharge Elimination System (NJPDES) permitting system in 1981. As discussions continue among the Service, the EPA, and the State of New Jersey, it is expected that future consultations will be undertaken to analyze the various other aspects of the NJSWQS and the potential for adverse impacts to federally listed species.

A. MIXING ZONE POLICY

Mixing zones are localized areas of surface waters receiving wastewaster effluent where water quality standards are not enforced, but where acutely toxic conditions are prevented. The NJSWQS mixing zone policy states the following: "Water quality within a mixing zone may be allowed to fall below applicable water quality criteria provided the existing and designated uses outside the mixing zone are not adversely impacted" and "... mixing zones shall be limited to that which will not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem or which diminishes other beneficial uses disproportionately." The New Jersey Department of Environmental Protection designates mixing zones on a case-by-case basis, taking into consideration the extent and nature of the receiving waters.

B. ANTIDEGRADATION POLICY

Each State must develop, adopt, and retain a statewide antidegradation policy, and identify the methods for implementing such a policy. The State antidegradation policy and implementation procedures must be consistent with the EPA's Water Quality Standards Regulations (Regulations) (40 CFR 131). As stated in the Regulations (40 CFR Part 131.3), "existing uses" are defined as those uses actually attained in the water body on or after November 28, 1975, whether or not such uses are included in the water quality standards. The Regulations (40 CFR Part 131.12 (a)(1)) further state that "existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." The NJSWQS antidegradation policy is consistent with EPA's Regulations in stating: "... existing uses shall be maintained and protected"; however, the State's antidegradation policy does not clearly indicate that federally listed species are recognized within the NJSWQS as an existing use that must be considered.

New Jersey's antidegradation policy incorporates a three-tiered approach, as advocated by the EPA, with an additional category to include waters within the Pinelands Area, as established in the Pinelands Protection Act (N.J.S.A. 13:18A-1 *et seq*.).

Nondegradation Waters are those waters set aside for posterity because of their clarity, color, scenic setting, other characteristic of aesthetic value, unique ecological significance, exceptional recreational significance, or exceptional water supply significance. Man-made wastewater discharges are prohibited in Nondegradation Waters.

Pinelands Waters are those waters within the boundaries of the Pinelands Area. Pinelands Waters are provided protection from any activity which might cause changes, other than toward natural water quality, in the existing surface water quality characteristics.

Category One Waters are those waters protected from any measurable changes to the existing water quality. Where water quality characteristics are generally worse than the water quality criteria, except as due to natural conditions, Category One Waters are provided protection so as to improve waters to maintain or provide for the designated uses where this can be accomplished without adverse impacts on organisms, communities or ecosystems of concern.

Category Two Waters are those waters where water quality characteristics that are generally better than, or equal to, the water quality standards are maintained to protect existing and / or designated uses. Water quality characteristics that are generally worse than the water quality criteria are improved to meet the water quality criteria.

C. SURFACE WATER QUALITY CRITERIA

Numeric surface water quality criteria (SWQC) for toxic substances represent the maximum allowable concentration of the substance in surface water that will protect designated uses at or above the specified design flows. These criteria may be used to develop chemical-specific effluent limitations for a point source discharger in response to an application for a NJPDES permit. New Jersey's proposed SWQC for toxic substances (N.J.A.C. 7:9B-1.14(c)13) were developed for the protection of aquatic life and human health, but do not consider upper-trophic-level wildlife species such as the bald eagle and peregrine falcon. New Jersey's proposed criteria for three highly bioaccumulative substances (Table 1) are the focus of concern in this biological opinion.

1. DDT and Metabolites

DDT (1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane) is found in the environment with two metabolites, DDE (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene), and DDD (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane). Like many other chlorinated organic compounds, DDT and its metabolites are persistent in the environment, accumulate in biological tissues, and biomagnify in the food chain. The most stringent of New Jersey's proposed SWQC for these compounds are 588 parts per quadrillion (ppq) for DDT and DDE and 832 ppq for DDD.

2. Polychlorinated Biphenyls

The polychlorinated biphenyls (PCBs) are a group of 209 halogenated hydrocarbons that elicit a variety of toxicological effects depending on the PCB mixture and the receptor species. Death, reproductive failure, immunosuppression, liver damage, and wasting syndrome have been attributed to PCB exposure in wildlife. Like DDT and its metabolites, PCBs are highly persistent in the environment, easily accumulated from the diet, and biomagnify in the food chain. The most stringent of the proposed SWQC for PCBs is 244 ppq for the protection of human health. However, it is the Service's understanding that EPA intends to disapprove this proposed criterion for technical reasons; therefore, the Federal Toxics Rule human health criterion of 44 ppq will remain in effect for PCBs in New Jersey.

3. Mercury

The toxicity of mercury to wildlife has been well established in the laboratory, although it has not yet been documented as a major cause for unsuccessful reproduction in field studies of wild piscivorous birds. Mercury occurs in several forms in the environment, of which the most toxic is methyl mercury. Methyl mercury is also the predominant form in aquatic systems. Like DDT and PCBs, methyl mercury has a high potential to biomagnify in the food chain. New Jersey's proposed SWQC for mercury is 144,000 ppq based on "total recoverable mercury," which includes both organic and inorganic forms of the metal.

A summary of the proposed New Jersey SWQC for chemicals of concern in this biological opinion is presented in Table 1.

Table 1. New Jersey Proposed Surface Water Quality Criteria for DDT and Metabolites, PCBs, and Mercury in Fresh and Saltwater (ppq or pg/l).

Toxic Substance	**Freshwater Criteria**			**Saltwater Criteria**		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
DDD	--	--	832	--	--	837
DDE	--	--	588	--	--	591
DDT	1,100,000	1,000	588	130,000	1,000	591
PCBs	--	14,000	244	--	30,000	247
Mercury	--	--	144,000	--	--	146,000

V. STATUS OF THE SPECIES RANGEWIDE

A. BALD EAGLE

The dark brown body with white head and tail of the bald eagle (*Haliaeetus leucocephalus*) is well recognized as our Nation's wild living symbol. This large, powerful raptor of aquatic ecosystems is the only sea eagle regularly occurring on the North American continent. The species ranges from central Alaska and Canada to northern Mexico and is found primarily along estuaries, large lakes, reservoirs, major rivers, and seacoasts (U.S. Fish and Wildlife Service, 1995a). In winter, eagles prefer coastal and inland waterbodies where ice-free waters allow access to fish (DeGraaf and Rudis, 1986; DeGraaf *et al.*, 1991)

Bald eagles reach sexual maturity at 4 to 6 years of age, but some may be considerably older before breeding for the first time. Adult eagles tend to use the same breeding area, and often the same nest, each year (U.S. Fish and Wildlife Service, 1983). Nesting eagles prefer habitats with little human disturbance, near large bodies of water containing abundant food resources, and with large trees for nesting, perching and roosting (DeGraaf and Rudis, 1986; DeGraaf *et al.*, 1991). Eagles feed almost exclusively on live and dead fish when fish are abundant (U.S. Fish and Wildlife Service, 1990). In winter, when fish numbers are low, eagles will also feed on wildlife that can be caught easily or scavenged, such as waterfowl and other birds, small and medium-sized mammals, and carrion (Steenhof, 1978).

Shortly after World War II, the use of DDT and other organochlorine compounds became widespread. Spraying of DDT was extensive along coastal and other wetland areas to control mosquitoes. Later, DDT was widely used as a general agricultural and forest insecticide. As DDT accumulated in individual bald eagles from ingestion of contaminated prey items, the species' reproduction was adversely affected and eagle numbers plummeted. In the late 1960s and early 1970s, it was determined that dichlorodiphenyldichloroethylene (DDE), the principal breakdown product of DDT, accumulated in the fat tissues of adult female bald eagles and impaired calcium deposition during eggshell formation, resulting in thin-shelled eggs that were susceptible to breakage during incubation. Reproductive impairment in bald eagles, resulting from egg shell thinning and hatching failure, was widespread (U.S. Fish and Wildlife Service, 1995a). Other factors contributing to the decline of bald eagle numbers included human disturbance, habitat loss, direct shooting, trap injuries, poisoning, disease, and electrocution (U.S. Fish and Wildlife Service, 1983).

In 1978, the Service listed the bald eagle as endangered throughout the lower 48 States, except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where the species was designated as threatened (U.S. Fish and Wildlife Service, 1978). In establishing a recovery program for the bald eagle, the Service divided the lower 48 States into five geographical recovery regions as follows: Northern States, Chesapeake Bay, Southeastern States, Southwestern States, and Pacific (U.S. Fish and Wildlife Service, 1995a).

With the banning of DDT and other persistent organochlorines, increased habitat protection, stringent law enforcement, and other recovery efforts, the bald eagle population has increased in number and expanded in range in the contiguous 48 states. In 1963, only 417 active nests were reported in the lower 48 states, with an average of 0.59 young produced per active nest. In 1994, 4,452 breeding areas were occupied, with an estimated average young per occupied territory of 1.17. In 1995, the bald eagle was downlisted from endangered to threatened in all of the lower 48 states (U.S. Fish and Wildlife Service, 1995a).

Service policy provides for the preparation of biological opinions on certain species, such as the bald eagle, within specific recovery regions, rather than throughout the species entire range. New Jersey is within the Northern States and Chesapeake Bay geographic bald eagle recovery regions. Therefore, for the purposes of this biological opinion, the effects of the proposed action on the Northern States and Chesapeake Bay recovery region bald eagle populations were evaluated. In 1994, there were 1,772 known occupied bald eagle nesting territories within the 21-state Northern States recovery region. Productivity in the Northern States recovery region in 1994, based on 1,473 territories, was estimated at 1.26 young per occupied territory. In the Chesapeake Bay recovery region, 356 occupied territories and a productivity of 1.1 young per occupied territory were reported in 1994 (U.S. Fish and Wildlife Service, 1995a).

B. PEREGRINE FALCON

The American peregrine falcon (*Falco peregrinus anatum*) historically occurred throughout much of North America. In the early 1940s, the eastern United States peregrine falcon population was roughly estimated at 350 pairs. Following World War II, peregrine falcon populations declined precipitously in North America (U.S. Fish and Wildlife Service, 1987). Based on a survey conducted in 1975, the original eastern population of the American peregrine falcon was determined to be extirpated (Fyfe *et al*., 1976). Research implicated the use of organochlorine pesticides, particularly DDT, as the primary cause of this decline (Risebrough and Peakall, 1988). Other less significant factors included shooting, natural predation, illegal egg collection, disease, human disturbance at nesting sites, and loss of habitat to human encroachment (U.S. Fish and Wildlife Service, 1987).

Due to population declines of the American peregrine falcon, the Service listed the subspecies in 1970 as endangered under the Endangered Species Conservation Act of 1969 (Public Law 91-135, 85 Stat. 275). The subspecies was later included as an endangered species on the United States list of endangered and threatened species on October 13, 1970 (35 Federal Register 16047) and subsequently was listed in 1973 as endangered under the ESA. Five recovery regions were established for the American peregrine falcon: Alaska, Canada, Pacific Coast, Rocky Mountain / Southwest United States, and Eastern United States. The Eastern United States peregrine falcon recovery region is further subdivided into five recovery units: Mid-Atlantic Coast, Northern New York and New England, Southern Appalachians, Great Lakes, and Southern New England / Central Appalachians. New Jersey is included in the Mid-Atlantic Coast recovery unit (U.S. Fish and Wildlife Service, 1995b). In 1995, the Service published an advance notice of intent to prepare a proposal to delist the peregrine falcon (U.S. Fish and Wildlife Service, 1995b). However, the peregrine falcon has not yet been officially proposed for delisting. A final decision is pending while the Service reviews the scientific information received in response to the advance notice.

Following the ban on use of DDT and other organochlorine pesticides in the early 1970s (U.S. Fish and Wildlife Service, 1995b), reintroduction programs were initiated that successfully re-established breeding populations of the peregrine falcon in the eastern United States. As a result of captive breeding programs, approximately 1,250 peregrines have been reintroduced into the eastern United States (The Peregrine Fund, 1996). By 1994, an estimated 145 pairs had established nesting territories and raised 248 young in the five recovery units within the Eastern United States recovery region. Although the rate of recovery varies somewhat among the four remaining recovery regions, positive trends in all areas suggest that peregrine falcon populations are recovering (U.S. Fish and Wildlife Service, 1995b).

Peregrine falcons generally reach sexual maturity at 3 years of age. Usually, the male arrives at a nesting site and begins a series of acrobatic displays to attract a mate (U.S. Fish and Wildlife Service, 1987). Peregrines typically scrape shallow hollows for nests in gravel or debris on a ledge or bluff, in an area with a clear view of the surroundings (DeGraaf and Rudis, 1986). Reintroduced peregrines are also known to nest on tall buildings, bridges, and other man-made structures. Peregrines tend to return to the same nest each year and vigorously defend individual nesting territories. An average clutch of four eggs is laid in late March or April (U.S. Fish and Wildlife Service, 1987).

Peregrine falcons generally prefer open areas such as coastal marshes, high mountains, and open forested regions with rocky ledges overlooking rivers, lakes, or other water, near an abundance of prey items (DeGraaf *et al.*, 1991). In the northeast, some peregrine falcons have adapted to a more urban environment, nesting and roosting on tall buildings or artificial nest structures. In the eastern United States, peregrines winter primarily along the Atlantic Coast on barrier beaches or in cities (DeGraaf and Rudis, 1986). Peregrines generally prey on common passerine birds, gulls, terns, shorebirds, wading birds, and waterfowl (U.S. Fish and Wildlife Service, 1987; Ehrlich *et al.*, 1988).

C. DWARF WEDGEMUSSEL

Historically, the dwarf wedgemussel (*Alasmidonta heterodon*) occurred within 70 Atlantic Slope river systems in 11 states and one Canadian province, ranging from the Petitcodiac River System in New Brunswick, Canada to the Neuse River in North Carolina. Presently, the species is known from only 34 localities in 8 drainages (von Oettingen, pers. comm., 1996). The dwarf wedgemussel was listed as an endangered species pursuant to the ESA in 1990 (55 Federal Register 9447) (U.S. Fish and Wildlife Service, 1993).

Small in size, dwarf wedgemussel shells rarely exceed 1.5 inches in length. The dwarf wedgemussel occurs on muddy sand, sand, and gravel bottoms in creeks and rivers of various sizes. The species requires areas with slow to moderate currents, good water quality, and little silt deposition. The species recent dramatic decline, as well as the small size and extent of most of the remaining populations, indicate that individual populations remain highly vulnerable to extirpation (U.S. Fish and Wildlife Service, 1993). Freshwater mussels, including the dwarf wedgemussel, are sensitive to potassium, zinc, copper, cadmium, and other elements associated with industrial pollution (Havlik and Marking, 1987). Industrial, agricultural, and domestic pollution are largely responsible for the disappearance of the dwarf wedgemussel from much of the species' historic range (U.S. Fish and Wildlife Service, 1993).

Like other freshwater mussels, dwarf wedgemussel eggs are fertilized in the female as sperm passes over the gills. The dwarf wedgemussel is a long-term brooder with fertilization typically occurring in mid-summer and fall and release of glochidia (larvae) occurring the following spring and summer. Upon release into the water column, the glochidia attach to a fish host to encyst and metamorphose, later dropping to the streambed as juvenile mussels (U.S. Fish and Wildlife Service, 1993). Laboratory studies by Michaelson and Neves (1992) have shown the tesselated darter (*Etheostoma olmstedi*), Johnny darter (*E. nigrum*), and mottled sculpin (*Cottus bairdi*) to be glochidial host fish for the dwarf wedgemussel.

VI. ENVIRONMENTAL BASELINE

A. BALD EAGLE STATUS IN NEW JERSEY

Historically, 22 pairs of bald eagles were known to nest in New Jersey prior to 1960. As in other parts of the Nation, the New Jersey bald eagle population suffered serious declines attributed to the widespread use of DDT and other organochlorine pesticides, dwindling to just a single nest by 1968. From 1977 to 1982, New Jersey's single nesting pair failed to produce young.

Through the efforts of the New Jersey Division of Fish, Game and Wildlife, Endangered and Nongame Species Program (ENSP) and the Service's Patuxent Wildlife Research Center in Laurel, Maryland, a successful program of fostering captive-bred eaglets was initiated in 1982. In 1983, the ENSP augmented the fostering program by launching a hacking program that successfully released eaglets taken from nests in Nova Scotia and Manitoba, Canada (Niles *et al.*, 1991). In 1988 those management efforts started to show results as New Jersey's nesting bald eagle population slowly began to increase (Table 2) (Niles *et al.*, 1991; Millar, pers. comm., 1995; Clark, pers. comm., 1995; Clark, pers. comm., 1996).

Table 2. New Jersey Bald Eagle Nesting Productivity 1982-1995.

Year	Number of Occupied Nesting Territories	Young Produced per Occupied Territory
1982	1	0.00
1983	1	0.00
1984	1	0.00
1985	1	2.00
1986	1	2.00
1987	1	2.00
1988	2	1.00
1989	4	0.25
1990	5	1.00
1991	5	1.40
1992	6	0.50
1993	6	1.00
1994	10	1.20
1995	11	1.82

New Jersey contains important winter roosting and feeding areas for the bald eagle such as the Delaware Water Gap National Recreation Area and the Delaware River shoreline and tributaries in southern New Jersey. Due to human encroachment, few areas remain where habitat and food supplies are adequate to maintain wintering concentrations of bald eagles, free from human disturbance (Steenhof, 1978). Proper management of known wintering sites is essential for preserving and enhancing bald eagle populations. Proximity to a food source is one of the most important factors influencing winter roost site selection by bald eagles (Steenhof, 1978; Chester *et al*., 1990). Each January, a nationwide midwinter bald eagle survey is conducted to monitor bald eagle populations. In New Jersey, bald eagle observations during the midwinter eagle survey have risen from only six bald eagles observed in 1978 to a record total of 113 bald eagles observed in 1996 (Stiles *et al*., 1995; Clark, pers. comm., 1996).

In New Jersey, bald eagle pairs and nesting success are increasing overall; however, productivity in some individual pairs appears to be impaired (New Jersey Department of Environmental Protection, 1995). Studies conducted by the Service and others (as cited below) have documented that organochlorine contaminants and mercury are present in native fish and wildlife species from several areas in New Jersey and the Delaware Bay. As in the past, contaminants in southern New Jersey fauna may still play a role in reduced productivity of individual nesting pairs of bald eagles, peregrine falcons, and other birds of prey. Evidence that these effects may still be occurring in New Jersey raptors comes from reproductive studies in ospreys. Steidl *et al*. (1991a) found that eggs of ospreys nesting along the Delaware Bay have significantly higher levels of PCBs and DDT-related contaminants than eggs found along the New Jersey Atlantic Coast. These contaminants were suggested to contribute to the decreased productivity observed in the Delaware Bay nesting ospreys, as a higher frequency of unhatched eggs and thinner eggshells were evident in this localized population (Steidl *et al*., 1991b).

Although limited, data available for the bald eagle indicate that the subject contaminants are present in bald eagles in New Jersey and the surrounding area (U.S. Fish and Wildlife Service, 1995c). There is little information available on the effects of these contaminants on the bald eagle in New Jersey or neighboring States; however, one may expect similar adverse impacts to bald eagle productivity as were observed in the osprey. The suspected cause-and-effect relationship between contaminants and reproductive success may be even more evident in the bald eagle since this species consumes larger prey and a greater quantity of prey than the osprey, and resides all year in the Delaware Bay region.

The Service, in cooperation with the New Jersey Division of Fish, Game and Wildlife, has recently completed a study of contaminant levels in bald eagle nestlings from all active nests in the Delaware Bay area (U.S. Fish and Wildlife Service, 1995c). The results of this study are summarized in Table 3 and compared with similar study results from other parts of the country. It should be noted that contaminant levels were reported as whole blood concentrations for eagles in Maine, the Columbia River estuary, and the Klamath Basin of Oregon and California. For the purpose of comparison to New Jersey and Great Lakes data, which are based on plasma concentrations, whole

Table 3. **Comparison of DDE, PCB, and Mercury Concentrations (ppb) in Plasma and Whole Blood of Nestling Bald Eagles Collected from Various Locations in the United States.**

Location	Mean Concentration (Range)			Reference
	DDE[1]	PCBs[1]	Mercury[2]	
Delaware Bay	32 (18-64)	120 (ND-280)	233[3] (141-433)	U.S. Fish and Wildlife Service, 1995c
Great Lakes, shoreline	61 (13-306)	183 (33-520)	--	Bowerman *et al*., 1994
Great Lakes, interior	20 (2-193)	24 (5-200)	--	
Columbia River estuary	100[4] (20-480)	80[4] (ND-260)	470 (190-1,400)	Anthony *et al*., 1993
Maine (1991) State-wide	60[4] (ND-4,400)	180[4] (ND-5,520)	148 (16-1,050)	U.S. Fish and Wildlife Service, 1994a
Maine (1992) State-wide	162[4] (ND-2,600)	368[4] (ND-24,200)	178 (70-257)	
Maine (1992) Lake sites	--	--	553	
Maine (1992) River sites	--	--	253	
Maine (1992) Estuarine sites	--	--	94	
Oregon	--	(ND-580)[4]	--	Wiemeyer *et al*., 1989
Klamath Basin [SUBADULTS]	60[4]	28[4]	2.2	Frenzel and Anthony, 1989

[1] Concentration in plasma.
[2] Concentration in whole blood.
[3] Concentration in packed cells.
[4] Plasma concentration calculated from whole blood by multiplying by 2.

blood concentrations were converted to plasma concentrations by multiplying whole blood levels by a factor of two (U.S. Fish and Wildlife Service, 1994a). These estimated plasma concentrations of contaminants in bald eagle nestlings are presented in Table 3.

Plasma samples collected from 12 bald eaglets in the Delaware Bay area have been analyzed for DDT and its metabolites. The geometric mean concentrations of DDE and DDD in these samples were 32 ppb (range 18 - 64 ppb) and 11 ppb (range <10 - 34 ppb), respectively (U.S. Fish and Wildlife Service, 1995c). Although the DDE plasma concentrations detected in the Delaware Bay nestlings are similar to those reported for the inland Great Lakes region, they are generally lower than those reported for Maine, the Great Lakes shoreline, and the Columbia River estuary nestlings (Table 3).

PCBs were also detected in blood of bald eagle nestlings in the Delaware Bay region. Total PCB concentrations in plasma from Delaware Bay eaglets ranged from <50 - 280 ppb, with a geometric mean of 120 ppb (U.S. Fish and Wildlife Service, 1995c). Although the levels of PCBs in bald eaglet plasma from the Delaware Bay are not as high as those reported from the Great Lakes shoreline ecosystem or Maine, they are markedly higher than the interior Great Lakes ecosystem and also generally higher than those reported from Oregon and California, including the Columbia River estuary (Table 3).

Mercury levels in New Jersey bald eagle nestlings were similar to those measured in Maine nestlings. The geometric mean concentration of mercury in packed red blood cells from eaglets in the Delaware Bay area (primarily in New Jersey) was 233 ppb (U.S. Fish and Wildlife Service, 1995c). Whole blood mercury levels in Maine nestlings were 148 ppb in 1991 and 178 ppb in 1992 (U.S. Fish and Wildlife Service, 1994a). Levels varied significantly according to habitat. For example, mercury in whole blood from nestlings from lake sites had the highest concentrations, while river sites were lower, and estuarine sites were the lowest (Table 3).

In addition to the nestling blood samples discussed above, a single addled bald eagle egg was recovered in New Jersey in 1993. A high concentration of DDD (2.65 ppm fresh weight) was detected in this egg (U.S. Fish and Wildlife Service, 1995c). By comparison, addled bald eagle eggs collected in Maine in 1991 and in Arizona from 1977 to 1985 contained much lower DDD concentrations (Table 4). Fresh bald eagle eggs collected from the Columbia River estuary and non-viable eggs collected in Delaware and Maryland contained only slightly lower DDD concentrations compared to the New Jersey egg. However, the Delaware and Maryland eggs were collected from 1973 to 1979. Wiemeyer *et al.* (1984) suggested that a decline in DDT and metabolites occurred in the Chesapeake Bay eagle eggs during the period from 1969 to 1979. Additional declines in eagle egg DDD levels were noted from 1980 to 1984 (Wiemeyer *et al.*, 1993), which makes the high concentration detected in the 1993 New Jersey egg difficult to interpret.

Table 4. **Comparison of DDD, DDE, PCB, and Mercury Concentrations (ppm, fresh weight basis) in Eggs of Bald Eagles Collected from Various Locations in the United States.**

Location	**Mean Egg Concentration, ppm (Range)**				**Reference**
	DDE	DDD	PCBs	Mercury	
New Jersey	13.9	2.65	28.1	.075	U.S. Fish and Wildlife Service, 1995c
Maine (1991)	4.4 (1.0-11)	0.06 (0.03-0.1)	16.5 (2.7-66)	0.42 (0.22-1.3)	U.S. Fish and Wildlife Service, 1994a
Alaska	0.5	--	1.3	--	Bowerman *et al*., 1994
Great Lakes, 3 interior areas	1.7, 1.8, 2.2	--	5.0, 6.2, 9.0	--	
Lake Superior	3.2	--	8.5	--	
Lake Erie	2.8	--	20.0	--	
Lake Michigan	17	--	38	--	
Lake Huron	16	--	73	--	
Louisiana (1993)	1.3	ND[1]	4.5	0.34	U.S. Fish and Wildlife Service, 1994b
Arizona	3.3 (1.1-9.1)	0.08 (0.05-0.14)	1.1 (0.3-8.5)	0.14 (0.06-0.29	Grubb *et al*., 1990
Columbia River estuary	9.7 (4.0-20)	1.4 (0.3-2.6)	12.7 (4.8-27)	0.2 (0.13-0.36)	Anthony *et al*., 1993
Maryland (1978)	9.7	0.96 (0.56-1.6)	27	--	Wiemeyer *et al*., 1984
Delaware (1978)	28	3.1 (2.7-3.7)	29	0.19	Wiemeyer *et al*., 1984

[1] ND - Not detected

The concentration of DDE (nearly 14 ppm fresh weight) detected in the New Jersey bald eagle egg is on the high end of the range of those reported for most areas of the country (U.S. Fish and Wildlife Service, 1995c). Seven addled eagle eggs collected in Maine in 1991 contained DDE concentrations ranging from 1.0 to 10.9 ppm (U.S. Fish and Wildlife Service, 1994a). The New Jersey DDE concentration also exceeded levels reported for Alaska, Louisiana, Arizona, three Great Lakes interior breeding areas, and the Lake Superior and Lake Erie breeding areas, but was exceeded by the Lake Michigan and Lake Huron breeding areas geometric means (Table 4). The New Jersey DDE level was similar to levels found in fresh eggs recovered from nests in the Columbia River estuary and addled eggs from Delaware and Maryland from 1973 to 1979. Since decreasing trends in DDE concentrations in bald eagle eggs have been observed through 1984 (Wiemeyer *et al.*, 1993), the level detected in the New Jersey egg appears somewhat elevated for this geographic area (Table 4).

The total PCB concentration of over 28 ppm fresh weight in the New Jersey eagle egg recovered in 1993 (U.S. Fish and Wildlife Service, 1995c) represents an elevated level of PCBs when compared to study results from outside the Delaware Bay area. Total PCB concentrations in addled eggs were summarized in Bowerman *et al.* (1994) for a variety of Great Lakes breeding areas and Alaska. The New Jersey total PCB concentration exceeded the geometric mean reported for Alaska, three Great Lakes interior breeding areas, the Lake Superior and Lake Erie breeding areas, and was exceeded only by the Lake Michigan and Lake Huron breeding area geometric means (Bowerman *et al.*, 1994). Addled bald eagle eggs from coastal Louisiana and Arizona contained PCB levels well below those in the New Jersey egg analyzed (Table 4). Bald eagle eggs recovered from nests in the Columbia River estuary, Maine, Delaware, and Maryland contained comparable levels to the New Jersey egg (Table 4). Unlike declining DDT levels, egg PCB concentrations in the Chesapeake Bay area appeared fairly stable during the years studied (Wiemeyer et al., 1984).

Embryotoxic contaminants such as PCBs have been suggested to adversely affect productivity in other raptors such as osprey (Steidl *et al.*, 1991a and 1991b) and peregrine falcon (Steidl *et al.*, 1991c) in the Delaware Bay area. Although the egg and plasma PCB concentrations in New Jersey bald eagles were not remarkable in terms of the relatively stable PCB concentrations found in other areas, the degree of decreased productivity resulting from PCBs and other contaminants remains unknown (U.S. Fish and Wildlife Service, 1995c). The mercury concentration in one addled egg collected in New Jersey was lower than that reported for other areas of the United States (Table 4).

B. PEREGRINE FALCON STATUS IN NEW JERSEY

By the mid 1960's, contaminants, primarily DDT, had depleted the breeding stock of peregrine falcons in New Jersey (U.S. Fish and Wildlife Service, 1991a; Steidl *et al.*, 1991c). In 1975, recovery efforts began, which included a hacking program to release captively-bred, contaminant-free peregrine falcons throughout the State (U.S. Fish and Wildlife Service, 1991a; Steidl *et al.*, 1991c). The first known nesting attempt of captively-reared, introduced peregrine falcons occurred in New Jersey in 1979, nearly 15 years after the last wild peregrines attempted to breed in northeastern North America (Steidl *et al*., 1991c). Since that time, management and monitoring of New Jersey's re-established peregrine falcon population has been conducted by the New Jersey ENSP. Peregrine falcon nesting success in New Jersey is summarized in Table 5 (Clark, 1992; Clark, 1993; Amaral, pers. comm., 1995; Clark, pers. comm., 1996). Those first captively produced falcons were free of environmental contaminants when released; therefore, reduced productivity or eggshell thinning in the reintroduced population would suggest recent exposure to contaminants (Steidl *et al*., 1991c).

Although peregrine falcon populations in New Jersey have increased overall, productivity in some individual pairs appears to be impaired (Steidl, 1991a). Eggshells from peregrine falcons nesting in the northeast region of New Jersey in 1985-1988 were significantly thinner than those measured in 1981-1984 from the same region (Steidl *et al*., 1991c). In addition, both peregrine falcon whole bodies and eggs collected in New Jersey between 1986 and 1991 contained significant levels of contaminants.

An analysis of three adult peregrine falcons found dead on the southern New Jersey Atlantic Coast revealed average wet weight concentrations of total PCBs, total DDT, and mercury to be 55 ppm, 16.2 ppm, and 1.5 ppm, respectively (U.S. Fish and Wildlife Service, 1991a). In contrast, a single peregrine nestling found near the Delaware Memorial Bridge contained only 3.6 ppm wet weight of PCBs and 1.6 ppm of DDE (U.S. Fish and Wildlife Service, 1991b). The fledgling from the Delaware Bay was probably too young to have accumulated a high concentration of PCBs compared to the three adults from the southern New Jersey Atlantic Coast.

In another study conducted by the U.S. Fish and Wildlife Service (1996a, in prep.), non-viable peregrine falcon eggs were collected during the 1990 and 1991 nesting seasons and analyzed for PCBs, DDT and metabolites, and mercury. Average total PCB concentrations in Atlantic Coast and Delaware Bay eggs were 25.5 ppm (range 14.0 ppm - 33.9 ppm) and 17.3 ppm (range 9.61 - 22.3 ppm), respectively. DDE concentrations in eggs from the Atlantic Coast ranged from 1.97 ppm to 23.3 ppm, with an average of 10.7 ppm; Delaware Bay eggs ranged from 2.64 to 10.7 ppm, with an average of 6.39 ppm. Mercury concentrations averaged 0.479 for the Atlantic Coast (range 0.26 ppm - 0.68 ppm) and 0.0233 ppm for eggs collected from the Delaware Bay area (range 0.01 - 0.05 ppm).

Table 5. **New Jersey Peregrine Falcon Nesting Productivity 1979-1995 (Wild Production Only).**

Year	Number of Pairs Nesting Attempted	Young Produced per Active Site
1979	1	0.00
1980	2	2.00
1981	3	1.67
1982	4	1.50
1983	4	0.00
1984	9	0.00
1985	14	2.00
1986	12	2.00
1987	14	2.00
1988	13	1.00
1989	11	0.25
1990	10	1.00
1991	13	1.40
1992	13	0.50
1993	14	1.60[1]
1994	14	1.35
1995	15	2.33[2]

1 - productivity based on known outcome at 10 nests; outcome unknown at 4 nests
2 - productivity based on known outcome at 12 nests; outcome unknown at 3 nests

C. DWARF WEDGEMUSSEL STATUS IN NEW JERSEY

Historically, the dwarf wedgemussel was documented in New Jersey from the Hackensack, Passaic, and Delaware Rivers. Until 1995, the last documentation of the species in New Jersey was from Warren County in 1909 (New Jersey Natural Heritage Program, 1996). In 1995, six full dwarf wedgemussel shells and nearly a dozen shell fragments were discovered in the Pequest River by ENSP and Natural Heritage Program (NHP) zoologists. However, no live mussels or shells containing mussel tissue were recovered. The ENSP was unable to determine the age of the shells or shell fragments, although the shells are believed to be 10 years old or less (Bowers-Altman, pers. comm., 1995). The tesselated darter, a known host fish of the dwarf wedgemussel, was confirmed to occur in the Pequest River (New Jersey Natural Heritage Program, 1996). Surveys of historic and potentially suitable dwarf wedgemussel habitat by the ENSP and NHP are ongoing, funded in part by the Service.

VII. EFFECTS OF THE ACTION

A. MIXING ZONE POLICY

Mixing zones are essentially areas where water quality criteria are not enforced, but where acutely toxic conditions are prevented. Thus, sensitive species, such as the dwarf wedgemussel, could be adversely affected by diminished water quality should a population of the species occur within a mixing zone. The NJSWQS mixing zone policy states the following: "Water quality within a mixing zone may be allowed to fall below applicable water quality criteria provided the existing and designated uses outside the mixing zone are not adversely impacted" and "... mixing zones shall be limited to that which will not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem or which diminishes other beneficial uses disproportionately."

The dwarf wedgemussel historically occurred in New Jersey. Recently discovered shell material from the dwarf wedgemussel indicates that the species may still be present in New Jersey waters. Surveys are ongoing in New Jersey for this species, described by Clarke (1981) as "a rather rare and inconspicuous species." Therefore, it is possible that a mixing zone could be, or has been, authorized in a waterbody containing dwarf wedgemussel, which could result in injury or death to some or all individuals in the mixing zone.

B. ANTIDEGRADATION POLICY

As stated above, the antidegradation policy does not clearly indicate that federally listed species are recognized within the NJSWQS as existing uses. Therefore, further degradation of water quality in waters supporting the dwarf wedgemussel may occur as a result of the antidegradation policy.

It is the Service's position that when waters within New Jersey harbor federally listed aquatic species (such as the dwarf wedgemussel) and their supporting habitat, those resources constitute, at a minimum, an "existing use." Existing uses are defined as those uses that do not impair designated uses and that are actually attained in a waterbody on or after November 28, 1975. In Appendix A to Chapter 2 - General Program Guidance (antidegradation) of the Water Quality Standards Handbook, December 1983, the question of "how fully and at what level of protection is an existing use to be protected in order to satisfy the Antidegradation policy" is raised. EPA's response indicates that:

> "...Species that are in the water body and which are consistent with the designated use (i.e., not aberrational) must be protected, even if not prevalent in number of importance. Nor can activity be allowed which would render the species unfit for maintaining the use. Water quality should be such that it results in no mortality and no significant growth or reproductive impairment of resident species."

Existing uses are addressed as Category Two Waters under New Jersey's Antidegradation Policy and are defined as "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the Surface Water Quality Standards."

Because freshwater unionid mussels, including the dwarf wedgemussel, are sensitive to environmental changes, there are a number of ways in which dwarf wedgemussels could be adversely impacted by point source discharges. Goudreau *et al*. (1993) reported on the effects of wastewater treatment plant effluent on freshwater mollusks in the upper Clinch River, Virginia and determined that the mussel fauna found at two wastewater treatment plant outfalls were depleted. Previous researchers identified unionids as clean water organisms that are readily eliminated by environmental degradation (Havlik and Marking, 1987).

Because of their relative immobility, unionids are extremely vulnerable to toxic effluent (Havlik and Marking, 1987; Sheehan *et al*., 1989; Goudreau *et al*., 1993). While fish can move out of effluents quickly to avoid toxicants, mussels can only respond by closure. Goudreau *et al*. (1993) concluded that the closure response may not be effective for mussels downstream from wastewater treatment plants that continually release effluents. Those mussels exposed to intermittent doses of toxicants may survive by shutting their valves tightly until water quality improves. Goudreau *et al*. (1993) further suggested that young specimens may be periodically killed by high or prolonged exposure to pollutants.

The nature of the unionid life cycle makes the reproductive stages particularly vulnerable to point source pollution (Stein, 1971; Fuller, 1974). Sperm are fully exposed to toxicants upon release by males (Stein, 1971; Fuller, 1974), as are glochidia released by the female to parasitize host fishes. Goudreau *et al*. (1993) suggested that a certain level of exposure to chlorides or ammonia may prevent most glochidia from infesting fish, even if exposure to these toxicants is sublethal. In addition to toxicants in wastewater treatment plant effluent, the reproductive stages of unionids may be affected by bacteria and protozoans often present below wastewater treatment plant outfalls (Goudreau *et al*., 1993). Both the fertilized ova in the marsupia of a female mussel and glochidia are noted for their vulnerability to attack by both bacteria and protozoans (Fuller, 1974).

Degraded water quality would cause decreases in dissolved oxygen, increases or decreases in pH, increases in turbidity, temperature, nutrients (phosphorus and nitrogen), toxic pollutants, and the bioconcentration of some toxic pollutants. The impacts of poor water quality, including turbidity, alter useable habitat for resting, breeding and foraging. Loss of useable habitat would result in reduced fecundity, reproduction, growth, and may cause direct mortalities of dwarf wedgemussel host fish and reduce fish and other prey species for avian species (U.S. Fish and Wildlife Service, 1994c).

For the purposes of this biological opinion, the direct effects of implementing the NJSWQS antidegradation policy encompass only the direct or immediate effect on the species or its habitat. Direct effects result from the agency action, including the effects of interrelated actions and interdependent actions (50 CFR 402.02). Actions may be categorized as interdependent or interrelated to the federal action undergoing Section 7 review using the "but for" test. This involves determining whether the federal, State or private activity could occur "but for" the proposed action. In this mode, it is the Service's opinion that the NJPDES program is a direct, interrelated activity: *But for EPA's approval of the NJSWQS program, State-issued NJPDES permits would not be issued*.

C. SURFACE WATER QUALITY CRITERIA

The Service has concerns regarding the NJSWQS criteria established for the following pollutants: DDT / DDE, mercury, and polychlorinated biphenyls (PCBs). These contaminants pose a particular bioaccumulation problem for higher trophic-level animals including the bald eagle and the peregrine falcon. For some water bodies in New Jersey, approval of the proposed criteria could cause an allowable increase of current levels of DDT / DDE, mercury, and PCBs to the established criteria, resulting in potential adverse effects to bald eagles and peregrine falcons in these areas. Therefore, based on the information available, the Service concludes that the proposed action is likely to adversely affect the bald eagle and peregrine falcon due to detrimental effects of three contaminants: PCBs, DDT and metabolites, and mercury.

1. Effect Levels of DDT, Polychlorinated Biphenyls, and Mercury on Avian Species

a. DDT and metabolites

The effect of DDT and metabolites on eggshell thickness and reproductive failure has been demonstrated in a variety of birds, including American woodcock (*Scolopax minor*), grey heron (*Ardea cineria*), black duck (*Anas rubripes*), American kestrel (*Falco sparverius*), and eastern screech owl (*Otus asio*) (Dilworth *et al*., 1972; Cooke *et al*., 1976; Longcore and Stendell, 1977). American kestrels represent the species most closely related to the species of concern in this biological opinion in which the reproductive effects of DDT have been studied. In one study, twelve pairs of kestrels fed diets containing 2.8 ppm DDE for 2 years experienced 10 percent eggshell thinning following the first year (Wiemeyer and Porter, 1970). Two males died just after 1 year when weight loss and depletion of fat reserves occurred due to the onset of reproduction and molt (Porter and Wiemeyer, 1972). Lincer (1975) fed kestrels dietary levels of DDE of 0, 0.3, 3.0, 6.0 and 10 ppm for 6 months. Eggshells were significantly thinner than controls at levels of 3.0 ppm and above. Peakall *et al*. (1973) exposed American kestrels to 3, 6, and 10 ppm DDE in the diet and measured eggshell thickness, breaking strength, and permeability (reported in U.S. Environmental Protection Agency, 1993). Significant effects for each measurement endpoint were observed at the lowest dietary concentration (3 ppm).

Other species, less closely related to the bald eagle and peregrine falcon, are also sensitive to low levels of DDT in diets. Davidson and Sell (1974) exposed female mallards (*Anas platyrhynchos*) to technical grade and pure *p,p*'-DDT at dietary concentrations of 0, 2, 20, and 200 ppm for 11 months (reported in U.S. Environmental Protection Agency, 1995). Lethality was observed at 200 ppm, while a significant reduction in eggshell thickness was observed at 20 ppm. No effects were observed in the 2 ppm dietary level. However, Longcore and Stendell (1977) demonstrated that a dietary concentration of 2 ppm DDE impaired black duck reproduction, as eggshells following 5-month exposures were 18 to 24 percent thinner than controls. Ducks maintained on clean diets for 2 years after the treatment period continued to suffer DDE-induced eggshell thinning (10 percent thinner than controls).

Anderson *et al*. (1975) studied the reproductive success of brown pelicans (*Pelecanus occidentalis*) along the coast of southern California from 1969 to 1974 (reported in U.S. Environmental Protection Agency, 1995). During these 5 years, DDT and metabolites were measured in pelican eggs, as well as in anchovies (*Anchoa* spp.), the major food source. Total DDT concentrations in anchovies decreased during the experimental period from 4.27 ppm in 1969 to 0.15 ppm in 1974. At 0.15 ppm total DDT in the diet, the pelican fledging rate was reported to be 30 percent below the estimated rate necessary to maintain a stable population.

Dietary concentrations of DDT and metabolites at the lowest observable adverse effects level (LOAEL) or no observable adverse effects level (NOAEL) reported in studies of avian species are summarized in Table 6.

Table 6. Observed Effect Levels of DDT and Metabolites in Bird Diets.

Species	Endpoint	NOAEL	LOAEL	Reference
American kestrel	mortality	--	2.8 ppm DDE	Porter and Wiemeyer, 1972
American kestrel	eggshell thinning	0.3 ppm DDE	3.0 ppm DDE	Lincer, 1975
American kestrel	eggshell thinning	--	3 ppm DDE	Peakall *et al*., 1973
mallard	eggshell thinning	2 ppm DDT	20 ppm DDT	Davidson and Sell, 1974
black duck	eggshell thinning	--	2 ppm DDE	Longcore and Stendell, 1977
brown pelican	reduced fledging	--	0.15 ppm total DDT	Anderson *et al*., 1975

b. <u>Polychlorinated biphenyls</u>

Custer and Heinz (1980) fed 9-month-old mallards 25 ppm Aroclor 1254 in diets for 1 month prior to egg-laying. Treatment did not adversely affect reproductive success (measured by clutch size, fertility, the number of hens laying, survival of ducklings to three weeks, amount of time off the nest, and date of first egg laid) compared to the control group.

Compared to mallards, other avian species appear to be more sensitive to PCBs (U.S. Environmental Protection Agency, 1995). Bird *et al*. (1983) reported reduced semen quality in American kestrels fed 33 ppm Aroclor 1254, while Tori and Peterle (1983) reported impaired courtship and nesting behavior in mourning doves (*Zenaida macroura*) fed 10 ppm of the same mixture. In another study, white leghorn hens (*Gallus domesticus*) were exposed to Aroclor 1242 at 0, 5, 10, 20, 40, and 80 ppm in commercial feed for 6 weeks, then held an additional 6 weeks on PCB-free diets (Britton and Huston, 1973 as cited in U.S. Environmental Protection Agency, 1995). A significant decrease in hatchability of eggs was seen by the sixth week in the group fed 10 ppm, while no adverse effects were observed in the 5 ppm group. In contrast, 5 ppm Aroclor 1254 was found to cause reduced egg production and fertility in hens after 14 weeks (Platonow and Reinhart, 1973 as cited in U.S.

Environmental Protection Agency, 1995). Lillie *et al.* (1974) documented a significant reduction in growth of chicks produced from hens maintained on a diet containing 2.0 ppm Aroclor 1248 or Aroclor 1254.

Dietary concentrations of PCBs at which effects have been observed in avian species are summarized in Table 7.

c. Mercury

The predominant form of mercury to which piscivorous birds are exposed is methyl mercury, since this is the dominant form (nearly 100 percent) of mercury in fish. Methyl mercury is the most toxic form of mercury and has the greatest potential for bioaccumulation. The implications of mercury concentrations in blood are not well understood. As yet, there has been no correlation between blood concentration and decreased productivity in bald eagles (U.S. Fish and Wildlife Service, 1994a). However, the toxicity of mercury to wildlife has been well established in the laboratory, as described briefly below.

Table 7. Observed Effect Levels of PCBs in Bird Diets.

Species	Endpoint	NOAEL	LOAEL	Reference
American kestrel	reduced semen quality	--	33 ppm Aroclor 1254	Bird *et al*., 1983
mallard	reproductive success	25 ppm Aroclor 1254	--	Custer and Heinz, 1980
mourning dove	courtship behavior	--	10 ppm Aroclor 1254	Tori and Peterle, 1983
white leghorn hen	egg hatchability	5 ppm Aroclor 1242	10 ppm Aroclor 1242	Britton and Huston, 1973
white leghorn hen	reduced fertility	--	5 ppm Aroclor 1254	Platonow and Reinhart, 1973
white leghorn hen	reduced chick growth	--	2.0 ppm Aroclor 1248 or 1254	Lillie *et al*., 1974
American kestrel	reduced fertility	--	5 ppm Aroclor 1254	Lincer and Peakall, 1970

Black ducks fed diets containing 3.0 ppm methyl mercury for 28 weeks had elevated liver and kidney weights, as well as reproductive inhibition (Finley and Stendell, 1978). A dietary concentration of 1.1 ppm mercury for 8 weeks was associated with kidney lesions in juvenile European starlings (*Sturnus vulgaris*) (Nicholson and Osborn, 1984). A dietary level of 5.2 ppm fed over 12 weeks led to serious neurological effects and mortality in red-tailed hawks (*Buteo jamaicensis*), whereas 2.6 ppm in the diet did not cause any obvious adverse effects (Fimreite and Karstad, 1971).

Heinz (1974, 1975, 1976a, 1976b, 1979) studied the effects of methyl mercury over three generations of mallard ducks exposed to dietary concentrations of 0, 0.5, and 3.0 ppm. No effects were initially seen in the first generation at the 0.5 ppm dietary concentration (estimated to be equivalent to 0.1 ppm in a natural diet). However, abnormal laying behavior, impaired reproduction, and slowed growth of ducklings were observed in the second and third generations at the 0.5 ppm dietary concentration. Mallard hens exposed to 3.0 ppm exhibited reproductive impairment in the first generation.

Dietary concentrations of methyl mercury at which effects have been observed in avian species are summarized in Table 8.

Table 8. Observed Effect Levels of Methyl Mercury in Bird Diets.

Species	Endpoint	NOAEL	LOAEL	Reference
red-tailed hawk	neurological effects; mortality	2.6 ppm	5.2 ppm	Fimreite and Karstad, 1971
black duck	impaired reproduction	--	3.0 ppm	Finley and Stendell, 1978
European starling	kidney lesions	--	1.1 ppm	Nicholson and Osborn, 1984
mallard duck (2nd and 3rd generations)	impaired reproduction; reduced duckling growth	--	0.5 ppm	Heinz, 1974; 1975; 1976a; 1976b; 1979
mallard duck (1st generation)	impaired reproduction	0.5 ppm	3.0 ppm	

2. Comparison of Effect Levels with Dietary Levels

Lipophilic contaminants released into surface waters do not remain in the water column. Instead, they interact with sediments and biota, and magnify in concentration as the trophic level increases. In this manner, a small amount of PCBs, DDT, or mercury in the water can result in higher concentrations in small crustaceans and worms, which are eaten by small fish or birds. These in turn are eaten by larger predators (e.g., small fish are eaten by large fish, which are eaten by bald eagles; birds that feed on contaminated insects or crustaceans are eaten by peregrine falcons). Therefore, it is important to consider background concentrations of contaminants in prey items of bald eagles and peregrine falcons to assess future releases of PCBs, DDT and metabolites, and mercury into the environment.

a. Bald eagle

There is little information available to assess the level of DDT and its metabolites in bald eagle prey species in New Jersey. In a report by the U.S. Fish and Wildlife Service (1994d), common mummichogs (*Fundulus heteroclitus*) from the Cape May National Wildlife Refuge in southern New Jersey (Cape May County) were analyzed for DDT and metabolites. Maximum concentrations of DDE and DDD combined (0.18 ppm wet weight) were near concentrations found in anchovies that resulted in impaired reproduction of brown pelicans in southern California (Anderson *et al.*, 1975). Concentrations of DDE or DDD in mummichogs (0.22 ppm and 0.33 ppm, respectively) sampled from tidal streams in Cape May County in 1973 (Klaas and Belisle, 1977) were higher than the concentration in anchovies that caused reproductive impairment. White perch (*Morone americana*) sampled from the Delaware River had maximum DDE and DDD concentrations of 0.68 ppm and 0.27 ppm, respectively, while menhaden (*Brevoortia* sp.) collected form the Atlantic Coast had a combined DDD and DDE concentration of 0.09 ppm (Steidl *et al.*, 1991a). Since the fish sampled were generally small forage fish, it is likely that the larger, higher-trophic-level fish on which the bald eagle would feed would have higher concentrations than the mummichog or white perch. Total DDT in fish from the Delaware River sampled in 1984 ranged from 0.45 ppm in white sucker (*Catostomus commersoni*) to 1.35 pm in smallmouth bass (*Micropterus dolomieui*) (Schmidt *et al.*, 1990). Although DDTs in fish from the Raritan River appear to be lower (0.13 to 0.32 ppm, redear sunfish and white sucker, respectively) than in the Delaware River, concentrations in the white sucker are similar between the Delaware and Raritan Rivers, indicating that the type of fish sampled is important in evaluating contaminants in bald eagle diets.

Aroclors 1248, 1254, and 1260 were detected in fish from the Delaware and Raritan rivers, New Jersey, in 1984. Concentrations of the three mixtures combined ranged from 0.5 to 2.4 ppm (white sucker and largemouth bass (*Micropterus salmoides*), respectively) in the Delaware

River and from 1.1 to 1.4 in the Raritan River (white sucker and redear sunfish, respectively) (Schmidt *et al.*, 1990). Other fish samples taken from the Delaware River in 1989 contained similar concentrations to those sampled in 1984. Average PCB concentrations were 1.2 (n=5), 0.5 (n=5), and 0.7 (n=2) ppm for white perch, menhaden, and channel catfish, respectively (Steidl *et al.*, 1991a). The PCB levels in menhaden from the Atlantic Coast averaged 0.28 ppm (n = 5). The concentrations of PCBs found in some species of fish are near concentrations of PCBs fed to white leghorn hens that resulted in reduced fertility (Britton and Huston, 1973) and above concentrations that caused reduced chick growth (Lillie *et al*., 1974).

In 1992 - 1993, the Academy of Natural Sciences of Philadelphia conducted a screening survey of mercury concentrations in freshwater fishes throughout the state of New Jersey (Academy of Natural Sciences of Philadelphia, 1994). Fish collected from 32 of the 55 New Jersey sites had concentrations higher than the LOAEL of 0.5 ppm described above for black ducks. Highest mercury concentrations were observed in fish from Atlantic County and the New Jersey Pinelands area. Concentrations in fish ranged from maximums of 2.8 ppm in chain pickerel (*Esox niger*) and 3.9 ppm in largemouth bass from the Pinelands and Manasquan Reservoir, respectively up to 8.9 ppm (range of 3.0 to 8.9 ppm) in largemouth bass from the Atlantic City Reservoir. Mercury concentrations were above 0.5 ppm in all specimens collected from the Pinelands. Mercury concentrations tend to be higher in fish that eat other fish, and tend to increase with the age of fish and with decreased pH (Academy of Natural Sciences of Philadelphia, 1994).

b. Peregrine falcon

To assess current exposures of peregrine falcons to contaminants, the Service examined contaminant concentrations in peregrine falcon prey from the Delaware Bay and southern New Jersey Atlantic Coast (U.S. Fish and Wildlife Service, 1991b). Four composite samples of willets (*Catoptrophorus semipalmatus*), common grackles (*Quiscalus quiscula*), and blue jays (*Cyanocitta cristata*), one to five birds per composite, along with a single fish crow sample (*Corvus ossifragus*), were analyzed for organochlorine and elemental contaminants. Maximum DDE levels were detected in a common grackle composite and the single crow sample, at 0.90 ppm wet weight. Average DDE concentrations in the composites were 0.49 ppm, 0.70 ppm, and 0.32 ppm wet weight, for the willet, common grackle, and blue jay, respectively. Total DDT concentrations were slightly higher, at 0.51, 0.72, and 0.37 for these species, respectively. Total DDT concentration in the single fish crow was 0.90 ppm; the maximum total DDT concentration was detected in the grackle, at 0.98 ppm wet weight. The maximum total DDT concentration is near the dietary concentration observed to cause eggshell thinning in kestrels (Table 4). The birds sampled in this study may comprise up to 60 percent of the peregrine falcon diet (Steidl, 1990).

In the Service study (1991b), PCBs were detected in all four species of birds sampled. The maximum total PCB concentration detected was in the blue jay at 3.1 ppm wet weight, followed by the single fish crow at 1.7 ppm. The average total PCB concentrations were 0.38, 0.07, and 0.85 for the willet, grackle, and blue jay, respectively. The concentrations of PCBs in passerine birds from southern New Jersey are within the dietary concentrations fed to white leghorn hens that resulted in reduced fertility (Britton and Huston, 1973) and reduced chick growth (Lillie *et al.*, 1974).

Mercury was also detected in all samples. The maximum concentration (0.63 ppm wet weight) was detected in the willet; however, mercury in the individual crow sample was similar (0.57 ppm). Average mercury concentrations were 0.59, 0.16, and 0.17 ppm for the willet, grackle, and blue jay, respectively. All of these levels were near or above the dietary concentration shown to cause reproductive effects in mallard ducks (Heinz 1974, 1975, 1976a, 1976b, 1979). Mercury in the crow and willet samples were within one order of magnitude of the dietary lowest observed adverse effect level (LOAEL) observed in red-tailed hawks (Fimreite and Karstad, 1971).

3. Comparison of Egg Effect Levels with New Jersey Egg Concentrations

Lipophilic contaminants are readily transferred from the adult female to the egg. Therefore, measured contaminant concentrations in eggs can indicate the potential for reproductive failure. This is especially true when the mechanism of toxicity involves direct impacts to the developing embryo. Even when the mechanism of toxicity involves an effect on maternal physiology (as is the case with DDT), egg concentrations are useful because they are usually proportional to the dose ingested by the female and provide an indication of exposure of the female bird to contaminants prior to egg-laying.

Concentrations of PCBs, DDT, and mercury in the New Jersey bald eagle egg and peregrine falcon eggs can be compared to no observed adverse effect concentrations (NOAECs), LOAELs, and critical effect levels (levels at which reproductive failure was observed) in bird eggs (Bowerman *et al.*, 1995; Peakall *et al.*, 1990; Wiemeyer *et al.*, 1984; Yamashita *et al.*, 1993). It is apparent that PCB and DDE concentrations in the New Jersey bald eagle and peregrine falcon eggs exceeded many of these criteria (Table 9). The concentration of DDE and PCBs in the bald eagle egg exceeded the NOAEC and LOAEL, while mercury in the egg was not significant. DDE and PCBs in peregrine falcon eggs also exceed the NOAEC and the LOAEL, and in some eggs were above the critical effects level. Mercury in some peregrine falcon eggs exceeded the NOAEC but all eggs were below the critical effect level. These data indicate that New Jersey raptors may currently be at risk due to PCBs, DDT and metabolites, and mercury levels that are already present in the environment.

Table 9. **Comparison of Contaminant Concentrations in New Jersey Bald Eagle and Peregrine Falcon Eggs to Observed Effect Levels in Eggs.**

	Egg Concentrations, ppm			**REFERENCE**
	DDE	Total PCB	Mercury	
NOAEC (Bald eagles)	3.5	4.0	0.5	Bowerman *et al*., 1995
Critical Effect Level (Several species)	15-20	>40	>1	Peakall *et al*., 1990
LOAEL egg lethality (bald eagle)	5	4	--	Wiemeyer *et al*., 1984
embryo deformities (caspian terns)	--	4.2	--	Yamashita *et al*., 1993
New Jersey Bald Eagle Egg	13.9	28.1	0.075	U.S. Fish and Wildlife Service, 1995c
New Jersey Peregrine Falcon Eggs	1.2-23	9.6-34	0.01-0.68	U.S. Fish and Wildlife Service, 1996 (in prep.)

4. Comparison with Great Lakes Initiative Wildlife Criteria

Due to the lack of site-specific information provided for New Jersey, the Great Lakes Initiative (GLI) wildlife criteria for DDT, PCBs, and mercury (U.S. Environmental Protection Agency, 1995) were used to compare to the NJSWQS as a measure of how protective the New Jersey criteria are for bald eagles and peregrine falcons. The GLI refers to the final guidance for water quality developed by the EPA, which specifies numerical limits on pollutants in ambient Great Lakes waters to protect human health, aquatic life, and wildlife (U.S. Environmental Protection Agency, 1995). In the development of these criteria, the EPA researched the toxicity, bioaccumulation, and biomagnification of certain pollutants, and gathered information on behavior and dietary composition and consumption of various species, including eagles, specific to the Great Lakes region. Wildlife criteria were developed from the site-specific information, resulting in water concentrations for compounds such as DDT, PCBs, and mercury that were believed to be safe for all avian and mammalian wildlife. Therefore, a comparison of the New Jersey proposed criteria to the GLI criteria is a measure of their protectiveness to bald eagles and peregrine falcons.

The Great Lakes Initiative (GLI) wildlife criterion for DDT and metabolites is 11 parts per quadrillion (ppq), whereas the New Jersey chronic aquatic life criterion for DDT is almost 700 ppq, and the chronic human-health criterion for DDT and DDE is 588 ppq. If the human-health criterion of 588 ppq is applied to all waters, it would be a factor 53 times greater than the proposed GLI criterion. Based on information presented by the EPA in the GLI, which concluded that a DDT SWQC of 11 ppq would be necessary for protection of wildlife, the NJSWQS criterion for DDT and its derivatives is unlikely to be protective of bald eagles and peregrine falcons.

The NJSWQS specifies an aquatic life criterion of 14,000 ppq for PCBs. The NJSWQS human-health criterion for PCBs is 244 ppq. However, it is the Service's understanding that the latter is being disapproved by EPA; therefore, the Federal Toxics Rule human health criterion of 44 ppq will remain in effect for PCBs in New Jersey. Although the Federal Toxics Rule human health criterion of 44 ppq for PCBs is less than the Great Lakes Initiative (GLI) wildlife criterion of 74 ppq, the Service is concerned about the adoption of the 44 ppq criterion because of the information presented by Ludwig *et al*. (1993) and the accumulating data indicating high levels of PCBs in the New Jersey bald eagle and peregrine falcon populations (U.S. Fish and Wildlife Service, 1995c; 1996a in prep.). A more stringent water quality criterion for PCBs has been derived (Ludwig *et al*., 1993), based on the toxicological responses of wildlife. Ludwig *et al*. (1993) provide a basis for a PCB water quality criterion of 1.0 ppq, based on a LOAEL derived from either field observations or from controlled laboratory studies. The toxicological impacts of PCBs to the New Jersey raptor populations would be at least stabilized by promulgation of a more stringent NJSWQS criterion than the existing criterion of 44 ppq.

Similarly, the GLI wildlife criterion for mercury is 1,300 ppq, whereas New Jersey proposes a human-health criterion for mercury of 144,000 ppq. This is a factor of 110 times greater than the GLI wildlife criterion. Thus, the New Jersey proposed criterion for mercury is unlikely to be protective of bald eagles and peregrine falcons.

D. CUMULATIVE EFFECTS OF PROPOSED ACTION

Cumulative effects include the effects of future State, local government or private actions on endangered or threatened species or critical habitat that are reasonably certain to occur in the area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act.

Future anticipated non-federal actions that may occur in or near State waters in New Jersey include fishing, hiking, swimming, camping, off-road vehicle use, road building, sand and gravel operations, agriculture, silviculture, and urbanization. Such non-federal actions may contribute to continued degradation and loss of river and stream habitats and are likely to have an adverse effect on endangered and threatened species.

VIII. CONCLUSION

After reviewing the current status of the bald eagle, American peregrine falcon, and dwarf wedgemussel, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the EPA's approval of the NJSWQS (with disapproval of the human health PCB criteria), as proposed, is not likely to jeopardize the continued existence of the bald eagle, American peregrine falcon, and dwarf wedgemussel. No critical habitat has been designated for these species, therefore, none will be affected.

IX. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of federally listed species of fish or wildlife without a special exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to federally listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is defined as any action that creates the likelihood of injury to federally listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of federally listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or the applicant. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The reasonable and prudent measures described below are non-discretionary, and must be implemented by the EPA so that they become binding conditions of the approval issued to the State of New Jersey with regard to the Surface Water Quality Standards in order for the exemption in section 7(o)(2) to apply. The EPA has a continuing duty to regulate the activity covered by this incidental take statement. If the EPA (1) fails to require the State of New Jersey to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the approval document, or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

In the case of non-jeopardy determinations, the regulations require that the Service anticipate the amount or extent of take that is likely to occur incidental to the federal action. Incidental take is difficult to quantify in terms of loss of or harm to dwarf wedgemussel because of the lack of data on dwarf wedgemussel populations extant in New Jersey. Regardless, it is expected that the authorization of mixing zones and the implementation of the antidegradation policy could result in take of dwarf wedgemussel from the diminished water quality. However, the best scientific and commercial data available are not sufficient to enable the Service to estimate a specific amount of incidental take. Therefore, the Service has designated the expected level of take as unquantifiable.

Based on the information available, the Service believes that the proposed action is likely to result in incidental take of the bald eagle and peregrine falcon in New Jersey due to detrimental effects of three contaminants: DDT and its metabolites, PCBs, and mercury. The proposed New Jersey criteria for DDT and mercury in surface waters are greater than surface water concentrations determined by the EPA in the GLI (U.S. Environmental Protection Agency, 1995) to be protective of bald eagles. Furthermore, in a biological opinion prepared by the Service's Chicago Field Office, the Service concluded that even the GLI wildlife criteria for DDT, mercury, and PCBs were not protective of federally listed threatened and endangered species, and may result in incidental take of bald eagles and peregrine falcons (U.S. Fish and Wildlife Service, 1995d). Therefore, the criteria proposed by New Jersey for PCBs, DDT, and mercury in surface water are likely to result in incidental take of bald eagles and peregrine falcons.

Due to chronic toxicity of the individual compounds and possible additive or synergistic activity of combinations of these compounds with each other or with other compounds present in surface water, the potential exists for bald eagle and peregrine falcon mortality or disruption of normal behavioral patterns. However, because of the complexity of the organisms and ecosystems involved, the limited information on the mode of action of these compounds singularly and in combination with other compounds, and the difficulties associated with monitoring and analyses, the likelihood of discovering an individual death conclusively attributable to these compounds is small. For example, behavioral changes induced by contaminant exposure may potentially lead to death of an individual bald eagle or peregrine falcon, or to decreased reproductive success. Thus, although the Service expects incidental take associated with DDT, mercury, and PCBs as indicated by the reasons given above, the best scientific and commercial data available are not sufficient to enable the Service to estimate a specific amount of incidental take. Therefore, the Service designates the expected level of take as unquantifiable.

To the extent that this incidental take statement concludes that take of bald eagles and American peregrine falcons will result from EPA's approval of the NJSWQS, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions specified herein.

X. REASONABLE AND PRUDENT MEASURES

The Service has concluded that the following reasonable and prudent measures are necessary and appropriate to minimize take:

1. Ensure that mixing zones are not established or permitted in waters with documented occurrence of dwarf wedgemussel.

2. Minimize degradation of New Jersey waters supporting occurrences of the dwarf wedgemussel.

3. Reduce PCB, DDT, and mercury criteria in the New Jersey Surface Water Quality Standards to levels that will minimize adverse effects of these compounds on the bald eagle and peregrine falcon.

XI. TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of ESA, the EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The 1996 proposed revisions to the NJSWQS must include provisions within the mixing zone policy that prohibit mixing zones in areas with documented occurrence of the dwarf wedgemussel.

2. a. The 1996 proposed revisions to the NJSWQS must include provisions within the antidegradation policy that clearly indicate that federally listed species are existing uses. The antidegradation policy must be revised to include the specific provision that all federally listed endangered or threatened species occurring in or dependant on New Jersey waters, will be maintained and protected.

   OR

   b. The EPA must work with the Service and the State of New Jersey to develop procedures that will allow for review of proposed NJPDES permits for potential impacts to federally listed aquatic species. These procedures should provide for Service / State interchange on modifications to proposed projects to avoid any anticipated adverse impacts to federally listed aquatic species. If adverse impacts cannot be avoided, then the EPA shall use its authority under the Clean Water Act (Section 101(a)) and 40 CFR 123.44(a)(1) to federalize the proposed permit. If, after discussion between the Service and the EPA, it is determined that adverse impacts cannot be avoided and that the EPA intends to issue (or allow issuance) of the subject permit, the EPA will request initiation of formal consultation with the Service. After issuance of the Service's non-jeopardy biological opinion, the EPA will issue the subject permit, or allow for State issuance of the subject permit, provided that any reasonable and prudent measures provided in the Service's biological opinion for the subject permit are implemented.

3. Within the 1996 proposed revisions to the NJSWQS, as a minimum, adopt the Great Lakes Initiative criteria for DDT and mercury as an interim measure until New Jersey-specific numeric water quality criteria are developed for New Jersey surface waters that would be protective of the bald eagle and peregrine falcon. In the Great Lakes Initiative, the EPA developed wildlife criteria of 11 ppq for DDT and derivatives and 1,300 ppq for mercury. Also as an interim measure, adopt the wildlife criterion of 1.0 ppq proposed by Ludwig *et al*. (1993) for PCBs.

4. Conduct an assessment of biological impacts to the peregrine falcon and the bald eagle for the 1996 proposed revisions to the NJSWQS. Such an assessment of biological impacts should include the following:

   a. a comprehensive literature search from published sources to identify the laboratory and field toxicity of the subject contaminants to living organisms, particularly the bald eagle and the peregrine falcon;

   b. the results of water quality and sediment testing for the subject contaminants in New Jersey drainages where bald eagles and / or peregrine falcons are known to forage;

   c. a summary of the anticipated number of permitted discharges on major drainages where bald eagles and / or peregrine falcons have been documented;

   d. a determination of the relative bioaccumulation / biomagnification potential (rates of bioaccumulation) for PCBs, DDT, and mercury from water to fish and avian prey species, and from prey species to top predators (i.e., bald eagles or peregrine falcons);

   e. an evaluation of bald eagle and peregrine falcon productivity and eggshell thickness data and any relationship with the subject contaminants (to include data for the United States and / or the appropriate recovery zone for each species and a comparison of these data with data available for the State of New Jersey);

f. a summary of all available data used by the EPA in assessing potential impacts to bald eagles and peregrine falcons from the proposed 1996 revisions to the NJSWQS regarding feeding behavior, prey species utilization, water consumption, food consumption, and body weights in New Jersey;

g. information on non-point sources of the subject contaminants, (e.g., atmospheric deposition), sources outside New Jersey, and background in biota and sediments; and,

h. all other relevant data that may be useful in assessing potential impacts to bald eagles and peregrine falcons from bioaccumulating contaminants and in developing water quality criteria protective of such species.

5. By 1999, complete an ecological risk assessment that identifies the trophic transfer (bioaccumulation potential) of PCBs, DDT, and mercury, concluding in an approximation of the risk to bald eagles and peregrine falcons foraging in discharge areas in the State of New Jersey. Such an assessment must include all assumptions, uncertainties, and exposure factors used to identify risk.

6. By 1999, develop numeric water quality criteria for PCBs, DDT, and mercury contamination in New Jersey surface waters that would be protective of federally listed species, including the bald eagle and peregrine falcon.

XII. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs federal agencies to use their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Consistent with the Interagency Memorandum of Understanding to implement the ESA, signed on September 28, 1994 by EPA and 13 other federal agencies, the Service recommends that the EPA encourage the State of New Jersey to include protective language in the mixing zone policy that specifically protects federal candidate species. Candidate species are those plant and animal species for which the Service has sufficient information on the biological status and threats to propose the species as endangered or threatened under the Endangered Species Act.

2. To ensure that candidate species are maintained and protected as existing uses and, therefore, provided protection, the NJSWQS antidegradation policy should be revised to clearly indicate that federal candidate species are existing uses.

3. Develop numeric water quality criteria for other bioaccumulating compounds, such as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD, dioxin) in New Jersey surface waters that would be protective of federally listed species.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests timely notification of the implementation of any conservation recommendations.

XIII. CLOSING STATEMENT

This concludes formal consultation on the EPA's proposed approval of the 1994 revisions to the NJSWQS. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or, (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation of consultation.

In order to ensure protection for species where the level of take has been determined to be unquantifiable, the Service must have a mechanism to reinitiate Section 7 consultation. In the absence of extensive monitoring of all bald eagle, peregrine falcon, and dwarf wedgemussel individuals occurring in New Jersey, take resulting from implementation of the subject water quality standards will be difficult to ascertain. Therefore, discovery of even one specimen whose death is attributable to implementation of any one of these standards will require the EPA to reinitiate Section 7 consultation with this office. However, take above the level of one is *not* a violation of *Section 9* of the ESA as long as such take is in compliance with the terms and conditions described above.

The Service requests that no part of the biological opinion resulting from this formal consultation be used out of context and if the biological opinion is reproduced, it appear in its entirety.

XIV. REFERENCES

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APPENDIX A

Drainage Basins in New Jersey Supporting Documented Occurrences of the Dwarf Wedgemussel, Bald Eagle, and Peregrine Falcon

Major Drainages Supporting Documented Occurrences of the Dwarf Wedgemussel, Bald Eagle, and Peregrine Falcon

Dwarf Wedgemussel (*Alasmidonta heterodon*)

Pequest River Basin

Bald Eagle (*Haliaeetus leucocephalus*)

Alloway Creek Basin
Cohansey Creek Basin
Delaware River Basin (Salem, Sussex, & Warren Counties)
Dennis Creek Basin
Dividing Creek Basin
Doughty Creek Basin
Egg Harbor River Basin
Flat Brook Basin
Manumusken River Basin
Maurice River Basin
Miles Creek Basin
Mill Creek Basin
Mullica / Wading River Basin
Oldmans Creek Basin
Pequannock River Basin
Raccoon Creek Basin
Raritan River - South Branch Basin
Raritan River - North Branch Basin
Repaupo Creek Basin
Salem Creek Basin
Shimmers Brook Basin
Stow Creek Basin
Tuckahoe River Basin
Vancampens Brook Basin
Wanaque River Basin
Whooping Creek Basin

<u>Peregrine Falcon (*Falco peregrinus*)</u>

Arthur Kill River Basin
Atlantic Coastal Basin (Atlantic & Ocean Counties)
Baldwin Run Basin
Big Timber Creek Basin
Cooper Creek Basin
Crafts Creek Basin
Delaware River Basin (Camden, Salem, & Gloucester Counties)
Dennis Creek Basin
Dividing Creek Basin
Doughty Creek Basin
Elizabeth River Basin
Forked River Basin
Hackensack River Basin
Hudson River Basin
Lower Raritan Basin
Lower Passaic River Basin
Maple Swamp Basin
Miles Creek Basin
Mullica River Basin
Newton Creek Basin
Patcong Creek Basin
Pennsauken Creek Basin
Raccoon Creek Basin
Rahway River Basin
Repaupo Creek Basin
Salem Creek Basin
Sloop Creek Basin
Tuckahoe River Basin
Whooping Creek Basin